

1. Many of the dust swipe sampling data are reported as zero (i.e., no radioactivity detected). Based on the Minimum Detectable Activities (MDAs) reported in the Navy submittal, we can conclude that background levels were less than the MDAs and may be as low as zero. We cannot tell if background levels are higher than the proposed BPRG values. What are the detection limits of swipe analyzing instruments?
  - A. It is important to note that the swipe samples were collected from a non-contaminated concrete area that is used for determining concrete background. The dust that has accumulated on this area is not necessarily representative of concrete, but rather of dust that would accumulate in buildings at HPNS in the future. As this surface has been cleaned as part of background measurements, it is not surprising that little activity or variability was measured.

Background counts are one factor for determining the MDA. Other factors include instrument efficiency and total counting time. To reach a lower MDA a longer background count time may be required, increasing the number of background counts.

The minimum detectable concentrations (MDCs), which is the minimum detectable activity (MDA) per area, follow directly from the detection limit concept. The MDC is a level of radioactivity on a surface that can accurately be determined to be something other than background by an overall measurement process. MDCs calculations vary greatly based on ambient background levels, sample count times and ambient background count times.

For example, the Parcel G Retesting Work Plan uses the Ludlum Model 3030 as a swipe counter, the same instrument that was used by CDPH at Parcel A.

Count times required for various alpha MDCs using the Ludlum Model 3030P are as follows:

An MDC of 17.3 DPM/100 cm<sup>2</sup> requires a 1 min sample and background count time

An MDC of 3.5 DPM/100 cm<sup>2</sup> requires a 10 min sample and background count time

An MDC of 1.2 DPM/100 cm<sup>2</sup> requires a 60 min sample and background count time

Assumptions made are from the Ludlum specifications<sup>1</sup> as follows:

-Background count rate of 0.3 CPM

-Instrument efficiency of 32% (Ra-226)

The required sample and background count times exponentially increase the lower the required MDC.

There are an estimated total of 5,500 swipes required for the Parcel G buildings, and an estimated total of 23,000 swipes required for all of the buildings at Hunters Point.

Assuming a 40 hour work week for swipe processing, factoring in collection of 1 background sample for every 24 hours, would **require nearly 13 years to complete** at the 60 minute count time.

This is technically impractical, purely from the equipment detection limitations, although it should be noted other factors such as natural background interference and an unsustainable false positive rate also need to be considered.

When measuring levels so close to zero, there will inherently be false positives caused by factors not attributable to Ra-226 contamination including: NORM in dust, instrument background fluctuations, low counting statistics, and/or equipment uncertainties. Demonstrating compliance with the proposed Ra-226 removable contamination limit of 1.2 DPM/100 cm<sup>2</sup> would result in an unacceptably high percentage of false positives. Statistically our goal is to achieve a 95% confidence level, which from a data standpoint, means we have confidence that the same sample would be replicated plus or minus 2 sigma from the measurement point. Contractor data from other projects at Hunters Point supports this position.

Additional MDC information may be found on *NUREG-1507 Minimum Detectable Concentrations with Typical Radiation Survey for Instruments for Various Contaminants and Field Conditions*<sup>2</sup>

2. The 16.7 MDA reflects a 1-minute count time. I understand that the Navy could generate data with a lower MDA with no change in instrumentation by increasing the count time. For comparison, the CDPH used a 10-minute count time in their 2019 Parcel A dust sampling and achieved an MDA of 1.6 to 2.3. What is your rationale for 1 minute?

- A. The Parcel C, Building 253/211 project specifies a 1 minute count time, or longer to achieve an MDC that could accurately detect the removable activity levels presented in the Parcel C ROD, which for alpha was 20 DPM/100cm<sup>2</sup>. A 1 minute count time was sufficient to meet the MDC for the current release criteria. The 2019 Work Plan (which was reviewed by the regulatory agencies, including EPA) includes this rationale and approach, and was based on the current removable fraction limits. A 1 or 2 minute count time are standard industry practice to achieve MDCs at typical release criteria levels.

We recently received information from CDPH which explains their MDA. CDPH achieved an MDA of approximately 2.3 DPM/100cm<sup>2</sup> with the following inputs/assumptions:

- Background Count of 30 minutes
- Background count rate of 0.26 CPM
- Sample Count Time of 10 minutes
- Instrument efficiency of 39%

Using CDPH's assumptions, an MDC of 1.2 DPM/100cm<sup>2</sup> would be obtained using 35 minute sample and background count times. Background and instrument efficiencies will differ among projects, as noted with the previous assumptions using the Ludlum specifications. Even with an assumed increased instrument efficiency as high as CDPH's, the EPA proposed alpha removable fraction release criteria is still technically impracticable: Assuming a 40 hour work week for swipe processing, factoring in collection of 1 background sample for every 24 hours, would still **require nearly 6.5 years to complete** at the 35 minute count time.

Also important, the CDPH report includes the following information on the criteria used for determining the dust risk in the Parcel A homes. The Navy would also like to understand the risk evaluation that was used to derive the alpha and beta risk based values.

*"The table also included an EPA risk value (as measured in DPM), showing the minimum alpha and beta value that must be present (on the dust wipe) in order to result in a cancer risk of one in a million ( $1 \times 10^{-6}$ ). This risk value is calculated by multiplying the risk coefficients with a known alpha/beta activity, which is then used to calculate the minimum risk presented in the federal OSWER 9285.6-20 guidance. A minimum cancer risk of  $1 \times 10^{-6}$  was selected in accordance with the OSWER guidance. Using the above calculation method, the lowest number alpha and beta radionuclides that must be present for which anyone in the survey unit area could be exposed with a cancer risk of  $1 \times 10^{-6}$  is 40 dpm for alpha and 5,208 for beta. In other words, test results of 40 dpm for alpha and/or 5,208 for beta would have been necessary to reach a cancer risk of one in a million."*

3. The Navy used field instrumentation to analyze the dust swipes. I understand that the Navy could generate data with a lower MDA by using a fixed laboratory. Why didn't you send the dust samples you took to the lab?
  - A. The Parcel C, Building 253/211 Workplan did not include lab procedures. In general, the analysis in a lab is the same (similar instrumentation/analyzing process). The laboratory equipment would still require the unsustainable long count times noted above. Sending the swipes to the lab would only increase processing times due to shipping, lab capacity constraints, and limited processing times.
4. The dust swipe sampling data were collected on concrete. I understand background levels may differ in other types of building materials (e.g., sheet rock, wood, etc.).
  - A. Hunters Point buildings consist of a variety of materials, such as concrete, metal, glass, wallboard, wood, and tile. There may be other miscellaneous materials in limited areas.

Background levels do differ between material types. This is relevant for the scan/static measurements. The swipes measure whatever dust is present in the environment, and currently on the surface. Because of these, it is difficult to determine what specific material is present in the dust that is collected, which may include NORM.
5. The concrete scan data provide a measure of the total radioactivity (fixed plus removable) in concrete in an unimpacted building. I understood the Navy statement that some of EPA's proposed BPRG values were below background levels to refer to dust.
  - A. Though the focus of the discussion has been on the dust swipes and alpha removable fraction release criteria, it is important to note there are still considerations of material specific and environmental background radioactivity associated with total radioactivity. The concrete data was provided for perspective of background values associated with unimpacted concrete, which range as high as 41 DPM/100 cm<sup>2</sup> for alpha.

#### References:

1. Model 3030P Alpha-Beta Sample Counter Specifications  
[ HYPERLINK "<https://ludlums.com/products/all-products/product/model-3030p>" ]
2. NUREG-1507 Minimum Detectable Concentrations with Typical Radiation Survey for Instruments for Various Contaminants and Field Conditions  
[ HYPERLINK "<https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1507/index.html>" ]
3. CDPH Hunters Point Naval Shipyard Parcel A Survey  
[ HYPERLINK "<https://www.cdph.ca.gov/Programs/CEH/DRSEM/Pages/RHB-Environment/Hunters-Point-Naval-Shipyard-Parcel-A-1-Survey.aspx>" ]